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Browns Ferry Nuclear Plant

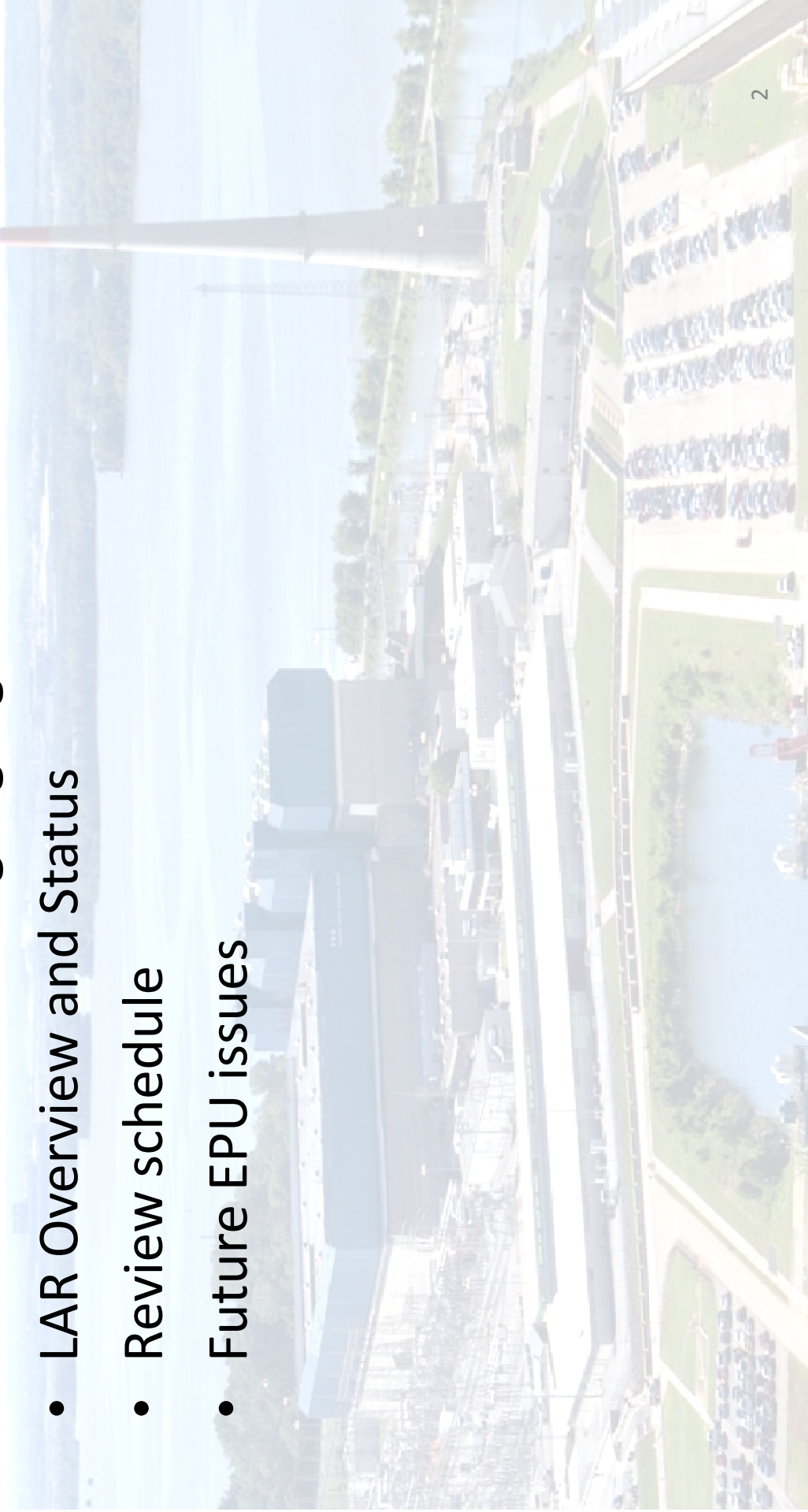


Browns Ferry XM Fuel Transition Update

November 15, 2012

Agenda

- Review June Meeting Highlights
- LAR Overview and Status
- Review schedule
- Future EPU issues



June Meeting Summary

- TVA desires to transition to ATRIUM-10 XM fuel
 - Industry proven design
 - Approved for Brunswick (similar plant)
 - XM design is compliant with ANF-89-98(P)(A)
 - NRC audited XM compliance documentation in November 2010
- LAR will be for all three Browns Ferry units
- First targeted XM reloads by unit
 - Unit 2 spring 2015, Unit 3 spring 2016, Unit 1 fall 2016
- Transition work will use Unit 2 cycle 19 as the basis for review
 - Will demonstrate transition from current ATRIUM-10 fuel to XM fuel
 - Will demonstrate application of several additional methods to BFN
- Transition cores will only contain AREVA fuel types
 - No multi vendor core issues
- TVA requesting approval for current power level only

June Meeting Summary (cont)

- Implementation requires use of additional AREVA methods
 - RODEX4
 - SAFLIM-3D
 - ACE
- The additional methods will be added to TS 5.6.5.b
- Application of existing AREVA methods in TS 5.6.5.b to Browns Ferry has received extensive NRC review
 - NRC methods audit August 2008
 - Unit 1 ATRIUM-10 LAR
- TVA suggested the LAR focus on application of the three new methodologies to Browns Ferry
- NRC requested thermal conductivity degradation be addressed in the LAR

June Meeting Summary (cont)

- LAR similar in content to the Unit 1 ATRIUM-10 LAR (TS-473)
 - Supplement with additional information
 - Application of the three additional methodologies to Browns Ferry
 - Address thermal conductivity degradation issue
 - Address ACE K factor issue (plant specific supplement)
- LAR will include a request to revise the SLMCPR for Unit 2
 - SAFLIM-3D based





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LAR Overview and Status

- Submittal Tech Spec change number assigned: TS-478
- Transition work essentially complete
 - All reports except Reload Safety Report received
- Reports being docketed for TS-478 (similar to TS-473)
 - Bundle mechanical design report (ANP-3150)
 - Thermal hydraulic compatibility report (ANP-3082)
 - Fuel cycle design report (ANP-3145)
 - Reload safety analysis report (ANP-3167)
 - LOCA break spectrum report (ANP-3152)
 - LOCA analysis uses revised core spray modeling method
 - Licensing methods compendium (ANP-2637) - *revised*
 - RAI report (ANP-2860) – *supplemental*
- RAI report
 - Prior RAIs in ANP-2860 screened along with Brunswick RAIs
 - Questions impacted by fuel type changes screened in
 - Updated responses included in the supplement

LAR Overview and Status (cont)

- Additional reports being docketed
 - Fuel rod thermal mechanical report (ANP-3159)
 - Equilibrium fuel cycle design report (ANP-3148)
 - SLMCPR analysis report
 - SAFLIM 3-D based
 - Conductivity degradation report (ANP-3170)
 - BFN specific ACE supplement (ANP-3140)
- ACE supplement
 - Approved ACE methodology has a known issue
 - Axial averaging process for K factor
 - Generic ACE supplement still under review by NRC
 - Tech Spec markups for TS 5.6.5.b will reflect the BFN specific supplement
 - TVA will evaluate revising LAR to reflect generic supplement if approved prior to TS-478

LAR Overview and Status (cont)

- Thermal conductivity degradation issue
 - RODEX2 still used for transient and LOCA analyses
 - Legacy ATRIUM-10 fuel will still utilize this method for thermal-mechanical evaluations
 - RODEX4 addresses conductivity degradation
 - Used for thermal-mechanical evaluations for XM fuel
 - A BFN evaluation report has been prepared (ANP-3170)
 - Report address impacts of conductivity degradation on:
 - Transient AOO events
 - Overpressure events
 - LOCA
 - Stability
 - Fire protection events

LAR Overview and Status (cont)

- LAR License Commitment
 - Brunswick SER for use of RODEX4 raised an issue
 - NRC had concerns over oxide thickness
 - 130 micron limit in the topical report
 - Concerns that significant oxide spalling could occur at these levels
 - Available AREVA fuel data shows no concerns up to 85 microns
 - Brunswick committed to restricting calculated oxide to 85 microns when using RODEX4
 - TVA will comply with this same reduced limit
 - Browns Ferry LAR contains a commitment to this effect

LAR Overview and Status (cont)

- Other Emerging Issues Addressed in RAI Process
 - Upcoming Regulation and SRP revision
 - Reactivity Insertion Accident (RIA), LOCA, Hydrogen Content, etc.
 - Plant specific responses needed to address emerging concerns
 - No Regulation/SRP in place to provide final criteria for evaluation
 - Approved methods are not in place yet to address all emerging issues
 - Potential for understanding of phenomena, NRC focus of concern, and methods of evaluation to evolve over time
 - NRC Top Fuel paper suggests that emerging RIA issues will be addressed in RAI process (Paul Clifford)
 - “If an existing licensee voluntarily seeks a license amendment or change and (1) the NRC staff’s consideration of the request involves a regulatory issue directly relevant to RIA and (2) the specific subject matter of this new guidance is an essential consideration in the staff’s determination of the acceptability of the licensee’s request, then the staff may request that the licensee either follow the new guidance or **provide an equivalent alternative process that demonstrates compliance with the underlying NRC regulatory requirements.**”

LAR Overview and Status (cont)

- Reactivity Insertion Accident
 - RIA Criteria that will be supported by LAR
 - Show the current radiological source evaluation bounds the number of rods failed based on peak radial average fuel enthalpy rise criteria of 170 cal/g (high cladding temperature failure criteria for zero power conditions)
 - Show that interim criteria for core coolability of 230 cal/g peak average fuel enthalpy rise is met
 - Compliance with other underlying NRC regulatory requirements will be demonstrated as requested during RAI process

LAR Overview and Status (cont)

- Technical Specifications
 - All three units will have changes to TS 5.6.5.5.b
 - Remove reference to ANF-524PA (*SAFLIM2*)
 - Add reference to ANP-10307PA (*SAFLIM-3D*)
 - Add reference to BAW-10247PA (*RODEX4*)
 - Add reference to ANP-10298PA (*ACE for XM*)
 - Add reference to ANP-3140P (*BFN ACE supplement*)
 - Unit 2 will also have a change to TS 2.1.1.1 (SLMCPR)
 - Tech Spec markup will show values of 1.06 for TLO and 1.08 for SLO
 - 0.02 reduction from current Unit 2 SLMCPR values
 - Conservatively selected relative to SAFLIM-3D calculated values
 - TVA is choosing not to pursue all the margin SAFLIM-3D can provide
 - Intention is to make the new SLMCPR cycle independent
 - TVA will request a change for Units 1 and 3 as part of the normal reload cycle process for first XM use at those units

LAR Overview and Status (cont)

- Technical Specification Bases changes
 - All three units TS Bases will be modified
 - B 2.1.1 Reactor Core SLs
 - B 3.2.1 APLHGR
 - B 3.2.2 MCPR
 - References in these Bases will be updated to reflect new methods
 - Modify discussion of low power SL to reflect new CPR correlation
- UFSAR
 - UFSAR changes will be made under 10CFR50.59 process

Schedule

- Target date for LAR submittal
 - January 2013
- SER need date
 - End of February 2014
 - Need date is tied to reload design and fuel fabrication milestones for Unit 2 cycle 19



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Future EPU Issues

- EPU versus XM timing
 - First XM application (unit 2 cycle 19) not targeted for EPU
 - 2016 reloads are *potential* EPU cycles
 - Unit 3 cycle 18
 - Unit 1 cycle 12
 - Potential for concurrent EPU and XM intro in these two cycles
 - TVA views this as acceptable under the ELTR process
 - Lead XM reload would not be EPU concurrent
- Additional EPU LAR information
 - Information docketed for EPU does not consider XM
 - Only GE14 and ATRIUM-10 considered
 - Meeting needed to discuss how to supplement EPU LAR to account for XM fuel



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Discussion

